ATMOSPHERIC COMPOSITION AND CLIMATE
INFORMATION SHEET
FY 2007

The Atmospheric Composition and Climate Program (ACC) pursues two overall research objectives: (i) to improve the predictive understanding of the radiative forcing of the climate system by aerosols and by chemically active greenhouse gases, such as tropospheric ozone and methane, and (ii) to better characterize the recovery of the stratospheric ozone layer, including its role in climate change. The integrated research activities that address these objectives involve instrument development, regional to global observations, laboratory studies, and theoretical modeling by NOAA and extramural partners. A hallmark of the Program is that its objectives are cooperatively framed with both national and international collaborators. NOAA has several key partners in its climate research; for example, NASA, NSF, DOE, and NOAA co-plan and execute collaborative/coordinated field studies. Further, frameworks exist to facilitate this cooperation: (i) from an organizational perspective, e.g., the CCSP/USGCRP Atmospheric Composition interagency subgroup, which NOAA and NASA co-chair; and (ii) via international coordination, e.g., the International Global Atmospheric Chemistry (IGAC) and Stratospheric Processes and their Role in Climate (SPARC) programs.

FY 2007 Focus

In general, ACC as part of NOAA's Climate Forcing sub-goal seeks to enable observations and measurements (data on sources, distributions and changes) to be used to make general predictions about climate change (via climate modeling) and thereby facilitate decision-making. ACC also strives to inform decision makers by means of information products. In FY 2007, ACC will give specific attention to proposed research advancing understanding of the interactions of aerosols with the global climate system. Aerosols play key roles in the Earth's climate system. However, crucial aspects of these roles remain poorly quantified. Several characteristics of aerosols, including the following, make quantification of their impact on climate challenging:

- their short residence time in the atmosphere and consequent temporal and spatial variability;
- their broad ranges of origins and compositions;
- the physical and chemical complexity of some aerosols (individual particles and populations);
- their reactivity in the atmosphere, including their effects on clouds and cloud systems.

Two overarching needs associated with a better understanding of the climatic roles of aerosols are (i) an observationally-based regional climatology of aerosols ("what's out there and how is it changing?"), and (ii) an observationally and theoretically built and evaluated predictive understanding of the processes linking emission sources to spatial and temporal distributions, chemical composition, and radiative properties of anthropogenic and natural aerosols ("why is it changing?"). Such regional observations and source/radiative characteristics are essential for improved radiative and climate models and assessment of their uncertainties, which, in turn, are the only tools that can yield estimated simulations of societal-needed "If …, then …" decision-support scenarios. Further, such observations are essential for evaluating and improving the needed global observations from, for example, the Aerosol Polarization Spectrometer (APS) on

the NPOESS platform.

In FY2007, ACC will concentrate on three focus areas designed to emphasize research outcomes. Attention will be given to proposals illustrating a direct link from the proposed research to the desired outcomes listed below.

(1) Research targeting processes or measurements germane to atmospheric composition that contribute to substantial uncertainty in simulations of aerosol/climate interactions. The principle research focus for ACC in FY 2007 is on contributing to a better predictive understanding of aerosols on the radiative balance of the atmosphere, with an emphasis on aerosol/cloud/climate interactions. The uncertainty associated with the influence of aerosols on climate is noted to be the largest single contributor to the uncertainty in radiative forcing by anthropogenic activities since the year 1750 [IPCC, 2001; CCSP, 2002]. Therefore, a better characterization of the effects of natural and anthropogenic aerosols on the radiative balance of the atmosphere is crucial for a more accurate prediction of the impact of human activities on climate [CCSP, 2002].

(2) Research aimed at improving the capability of climate models to simulate the influence of aerosol-chemical and aerosol-radiative effects on the radiative balance in the Earth's atmosphere. ACC seeks to support a direct progression from process-level research to improved global climate modeling. Proposals responding to this focus area should address current issues impeding the translation of process knowledge about aerosol/cloud/chemical/climate interactions into effective representations of these interactions in global climate models.

Please note that these two focus areas approach the same desired state from opposite directions. Proposals that target both of these areas will receive particular attention.

(3) Analysis and interpretation of data from the GoMACCS 2006 field campaign. This summer, NOAA will help lead a major multi-institutional intensive field program to study the influence of aerosols on the radiative balance of the atmosphere over Texas and the Gulf of Mexico. The NOAA-led climate component of this study will be called GoMACCS 2006 (the Gulf of Mexico Atmospheric Composition and Climate Study). The GoMACCS campaign is being conducted as part of a joint air quality/climate change mission called TexAQS/GoMACCS 2006 (the first part stands for Texas Air Quality Study).

This intensive field study will focus on providing a better understanding of the sources and atmospheric processes responsible for the formation and distribution of ozone and aerosols in the atmosphere and the influence that these species have on the radiative forcing of climate regionally and globally. In addition to clear-sky radiative effects, GoMACCS will investigate the influence of aerosols on cloud properties and the role of clouds in chemical transformation. The study objective is to better characterize marine/continental chemical and meteorological processes in order to improve the simulation of the radiative forcing of climate change by lower-atmosphere ozone and aerosol particles. This will be the first major experiment of NOAA's climate program initiative on the aerosol indirect effect.

The TexAQS/GoMACCS 2006 Science Plan is available at www.al.noaa.gov/2006. Additional information is located online at saga.pmel.noaa.gov/Field/TEXAQS, http://www.etl.noaa.gov/programs/2006/texaqs/, and

www.tceq.state.tx.us/implementation/air/airmod/texaqs-files/TexAQS_II.html. For more details on the TexAQS/GoMACCS 2006 field campaign, please contact Dr. Fred Fehsenfeld (303-497-5819; Fred.C.Fehsenfeld@noaa.gov).

Finally, some of the most challenging issues in characterizing and modeling aerosol/climate interactions lie at the interfaces between research specialties, fields, and program areas. Accordingly, ACC encourages its proposers to study the announcements of other program elements within the Climate Program Office. Proposals that are deemed responsive to both ACC and CPPA focus areas may be reviewed jointly and if selected may receive joint funding. **Please contact both program managers if you decide to pursue this option.**

References

The following references may be useful to proposers:

CCSP, July 2003. Strategic Plan for the Climate Change Science Program (available online at http://www.climatescience.gov/Library/stratplan2003/default.htm). See Chapters 1 through 3.

IPCC, 2001. Climate Change 2001: The Scientific Basis. Intergovernmental Panel on Climate Change (available online at http://www.ipcc.ch/). See Chapters 5 and 6, and see Section C, Technical Summary.

NOAA, September 2004. New Priorities for the 21st Century: NOAA's Strategic Plan Updated for FY 2005 – FY 2010 (available online at http://www.spo.noaa.gov/noaastratplanning.htm). See Mission Goal 2, "Understand climate variability and change to enhance society's ability to plan and respond."

NRC, 2004. Implementing Climate and Global Change Research: A Review of the Final U.S. Climate Change Science Program Strategic Plan (available online at http://www.nap.edu/books/0309088658/html/).

NRC, 2005. Radiative Forcing of Climate Change: Expanding the Concept and Addressing Uncertainties (available online at http://books.nap.edu/catalog/11175.html).

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